

### **Remarks/Arguments**

Applicant respectfully requests that the Examiner reconsider the above-identified patent application in light of the Amendment and following Remarks.

Claims 8-11 are pending; claims 1-7 have been withdrawn as directed to nonelected subject matter.

Applicant acknowledges the Examiner withdrawal pf the rejections of claims 8-11 under 35 U.S.C. 102(e) or under 35 U.S.C. 103(a) based on Striebel (U.S. Pat. No. 6,165,641) since lithium titanium disulfide ( $\text{LiTiS}_2$ ) as taught by Striebel is not readable on the claimed lithium titanate.

#### **35 U.S.C. 102(e) Rejection**

The Examiner rejected claims 8-11 under 35 U.S.C. 102(e) as being anticipated by U.S. Pat. No. 6,475,673 B1 (Yamawaki et al). The Examiner alleged that as to claim 8, 10, and 11, Yamawaki et al teach a lithium ion battery having a lithium titanate compound,  $\text{Li}_4\text{Ti}_5\text{O}_{12}$ , with a particle size “in the range of 0.1 to 15  $\mu\text{m}$  . . . ” (See Col. 4, lines 14-21). The Examiner purports that “in the range of 0.1”  $\mu\text{m}$ , particle sizes below 100nm are considered taught by Yamawaki et al, since particle sizes of 98 nm and 99 nm are in the range of 100 nm. The Examiner reasoned that while Yamawaki may express a preferred particle size of 300 nm to 10  $\mu\text{m}$  or 500 nm to 5  $\mu\text{m}$ , it provides motivation for the skilled artisan to focus on particle sizes in the range of 100 nm and to explore particle sizes below that range.

First, anticipation requires that each and every element of the claims be disclosed, either expressly or inherently, in a single prior art reference or embodied in a single prior art device or practice. *See In re Paulsen*, 30 F.3d 1475, 1478 (Fed. Cir. 1994); *Minnesota Min. & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 1565 (Fed. Cir. 1992). There must be no

difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of invention. *See Scripps Clinic & Res. Found. v. Genentech, Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991). A finding of anticipation “is not supportable if it is necessary to prove facts beyond those disclosed in the reference in order to meet the claim limitations.” *Id.* Absence of any claim element from the reference negates anticipation. *See Kloster Speedsteel AB v. Crucible, Inc.*, 793 F.2d 1565, 1571 (Fed. Cir. 1986).

“[A] prior art reference may anticipate when the claim limitations not expressly found in that reference are nonetheless inherent in it.” *In re Cruciferous Sprout Litig.*, 301 F.3d 1343, 1349 (Fed. Cir. 2002). The missing element must be “necessarily present in the thing described in the reference,” and “be so recognized by persons of ordinary skill.” *Rosco, Inc. v. Mirror Lite Co.*, 304 F.3d 1373 (Fed. Cir. 2002) (*citing Continental Can Co. v. Monsanto Co.*, 48 F.2d 1264, 1268 (Fed. Cir. 1991)).

An anticipatory reference must also enable a skilled artisan to make and use the claimed invention. *See Bristol-Myers Squibb Co. v. Ben Venue Laboratories, Inc.*, 246 F.3d 1368, 1374, 58 U.S.P.Q.2d 1508 (Fed. Cir. 2001)(*citing In re Donohue*, 766 F.2d 531, 533, 226 U.S.P.Q. 619, 621 (Fed. Cir. 1985)). “To be enabling, the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without “‘undue experimentation.’” *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993).

A rejection based on 35 U.S.C. §102(e) can be overcome by persuasively arguing that the claims are patentably distinguishable from the prior art, and by amending the claims to patentably distinguish over the prior art. MPEP 706.02(b).

Applicant urges that the pending claims are patentably distinguishable from the prior art because Yamawaki does not teach or suggest every limitation in every claim and the missing

claim elements are not necessarily present in the electrodes described in Yamawaki and would not be so recognized by persons of ordinary skill. The Examiner has extended the range of the particles in Yamawaki beyond that specified in the disclosure, which is not allowed. Yamawaki specifies that the average particle size of lithium titanate is in the range of 0.1 to 15  $\mu\text{m}$ , preferably in the range of 0.3 to 10  $\mu\text{m}$ , and more preferably in the range of 0.5 to 5  $\mu\text{m}$ . See col. 4: 18-21. Therefore the average Yamawaki particle size lies between 100 nm and 15  $\mu\text{m}$ , preferably between 300 nm and 10  $\mu\text{m}$ , and more preferably between 0.5 $\mu\text{m}$  and 5  $\mu\text{m}$ . Indeed, Yamawaki does not disclose, teach or suggest the synthesis or use of lithium titanate particles of less than 100 nanometers in diameter at all.

Second, the Examiner has not expressly rejected claims 8-11 as unpatentable under 35 U.S.C. 103(a), but uses language (“the patentees provide motivation for the skilled artisan to focus on particle sizes in the range of 100 nm and to explore particle sizes below that range”) that suggests that the Examiner may have intended a rejection under this statute. In the event that is the Examiner’s intention, Applicant further urges that the present invention is not obvious in view of Yamawaki.

For the Examiner to find that an invention is *prima facie* obvious, there must be a basis in the art for combining or modifying references (MPEP 2143.01), there must be a reasonable degree of predictability of success in the proposed modification or combination (MPEP 2143.02), and the prior art must teach or suggest every limitation in every claim (MPEP 2143.03). Moreover, for a reference to be a proper obviousness reference, it must contain (1) detailed enabling methodology for practicing the invention without undue experimentation; (2) a suggestion to modify the prior art to practice the claimed invention; and (3) evidence suggesting that the modification would be successful in achieving the invention. *In re O’Farrell*, 853 F.2d

894, 901, 7 U.S.P.Q.2d 1673, 1681 (Fed. Cir. 1988). See also *In re Nurnberg*, 33 U.S.P.Q.2d 1953 (Fed. Cir. 1994); *In re Vaeck*, 947 F.2d 488, 493, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

Applicant urges that the product of Yamawaki is not the same or similar to the product of the present invention because, as discussed above, Yamawaki does not teach or suggest every limitation in any of pending claims 8-11,. Even if Yamawaki presents an “obvious to try” situation, Yamawaki would motivate a skilled artisan to focus on larger particles, not smaller particles. Moreover, since “obvious to try” is an improper standard under 35 U.S.C. 103, Yamawaki does not contain a sufficient teaching of how to obtain the present invention.

By setting a lower limit of 100 nm and a preferred range much larger than 100 nm, it appears that Yamawaki was concerned with the nanomaterial sized (<100 nm) material, perhaps because of the notion that nanomaterials are detrimental to the performance of the battery due to parasitic reactions of the high surface area of the nanomaterials with the electrolyte and poor packing density. Indeed, some argue that nanomaterials are almost another state of matter due to the extraordinary increase of surface states that develop rapidly once the particle size is below 100 nm. In fact, the volume of material on the surface begins to be equal to and exceed that of the bulk in the nanomaterial range (1-100 nm), and surface states behave much differently than bulk.

Unlike Yamawaki, however, the disclosure of the present invention provides evidence of the extraordinary benefits of the nanomaterial lithium titanate. It discloses the high specific energy storage capacity and high recharge rates of a particulate lithium titanate intercalation compound comprising an average primary particle size of less than 100 nm. Fig. 5 of the present invention teaches the superior capacity retention of the smaller particle lithium titanate particles

of the present invention compared with larger particle size, and Fig. 7 shows the unexpected stability of that capacity.

Applicant further urges that the Examiner has not established either a basis for modifying the Yamawaki reference or a reasonable degree of predictability of success in any proposed modification of Yamawaki that would lead a person of skill in the art to achieve the invention described and claimed in the present application.

As for product by process claim 9, Applicant urges that the Office action's conclusion that the process limitations do not merit patentable weight is improper, since product-by-process claims have long been recognized as a "permissible technique that applicant may use to define the invention." MPEP 806.05(f). Where, as here, the process limitations define the resulting novel, unanticipated product, those limitations do indeed carry patentable weight. As explained in paragraph [007] of the specification, the product of the present invention is different from the prior art as a result of the process. As disclosed, the present invention resolved the problem in the prior art, i.e., that synthesized lithium titanate particles continue to enlarge during prolonged annealing. Unlike the prior art, the process of the present invention yields consistent nanostructure lithium titanate product, provides both materials and electrochemical cells that exhibit remarkable improvement over the prior art in high cycle rate capacity, and provides magnitude increases in economies of time and energy.

Since there is no prior art that teaches or suggests the claimed invention, Applicant respectfully requests that the Examiner withdraw all objections to and rejections of the present invention.

Applicant urges that this application is now in condition for allowance and earnestly solicits early and favorable action by the Examiner. If the Examiner believes that issues may be

resolved by a telephone interview, the Examiner is respectfully urged to telephone the undersigned at (973) 597-6170. The undersigned also may be contacted via e-mail at [blubit@lowenstein.com](mailto:blubit@lowenstein.com).

#### AUTHORIZATION

The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account No. 501,358.

Respectfully submitted,

Lowenstein Sandler PC

By:

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